REMARKS

Claim 1 has been amended. This amendment is intended as a clarification, to express more clearly what had originally been intended in the February 26, 2010 Amendment.

Claims 1-16 remain pending in the application.

The § 112, First and Second Paragraph Rejections

Claims 1-16 were rejected under 35 U.S.C. §§ 112, first and second paragraphs. Although these two rejections have different statutory bases, their rationales are similar. Both will be addressed together in the interest of efficiency.

Both rejections arise from an ambiguity that was unintentionally introduced by the prior, February 26, 2010 amendment to Claim 1. In that Amendment, the undersigned inadvertently used the terms "reactants" and "chemical groups" interchangeably.

It is respectfully submitted that the present amendment to Claim 1 clarifies the unintended ambiguity, in a straightforward manner that does not require extended discussion. It is respectfully submitted that the §§ 112, first and second paragraph rejections have both been overcome.

The § 102(e) Rejection

Claims 1, 2, 4, 6, 7, 10, and 14 were rejected under 35 U.S.C. § 102(e) as being anticipated by Nakagawa.

For the time being, only a single reason will be argued for distinguishing the claimed inventions from Nakagawa, as it appears to be particularly straightforward. Applicants reserve the right to present other arguments at a later date, should the need arise.

The § 102 rejection over Nakagawa was based on the premise that Nakagawa's calcium carbonate is a piezoelectric material. However, calcium carbonate does not in fact appear to be piezoelectric. The evidence provided by the Office clearly does not support the proposition that calcium carbonate should be expected to have piezoelectric

properties. The § 102 rejection is thus based on an incorrect premise, and should be withdrawn.

The Office cited Tsubouchi, U.S. Patent 3,767,579, Col. 4, lines 5-10 for the proposition that calcium carbonate is piezoelectric. It is respectfully submitted that this reliance is misplaced. Tsubouchi, Col. 4, lines 5-12, reads as follows:

> The starting materials for the piezoelectric ceramics according to the instant invention are powdered lead oxide (PbO), bismuth oxide (Bi_2O_3), nickel oxide (NiO), lithium carbonate (Li_2CO_3), niobium oxide (Nb_2O_5), titanium oxide (TiO_2), zirconium oxide (ZrO_2), calcium carbonate ($CaCO_3$), strontium carbonate ($SrCO_3$), and/or barium carbonate ($BaCO_3$), all chemically pure (purity of 98 percent or more).

This passage merely recites a list of starting materials, several different metal oxides and carbonates. There was no suggestion that calcium carbonate or any of the starting materials, standing alone, would be piezoelectric.

Rather, Tsubouchi described various quaternary and higher mixtures that could be sintered at high temperature to form complex, multi-component, piezoelectric ceramic systems. Optionally, some of these complex systems might contain small amounts of calcium. None of the systems were described as being composed solely, or even primarily, from calcium carbonate. See, for example, Col. 3, line 19 through Col. 4, line 2:

> In accordance with this invention, novel piezoelectric ceramics have been synthesized which comprise a quinary solid solution, $Bi(Ni_{1/2} \cdot Ti_{1/2})O_3$ -$Bi(Ni_{1/2} \cdot Zr_{1/2})O_3$ -$Pb(Ni_{1/3} \cdot Nb_{2/3})O_3$ -$PbTiO_3$ -$PbZrO_3$, or a quaternary solid solution having $Bi(Li_{1/2} \cdot Zr_{1/2})O_3$ instead of $Bi(N_{1/2} \cdot Ti_{1/2})O_3Bi(Ni_{1/2} \cdot Zr_{1/2})O_3$ contained in the quinary solid solution. When the solid solutions are represented by the formula:
>
> $$(Pb_{1-u} \cdot Bi_u) \cdot [M_t \cdot (Ni_{1/3} \cdot Nb_{2/3})_x \cdot Ti_y \cdot Zr_z] \cdot O_3,$$
>
> wherein M_t represents $Ni_{t/2}$ or $Bi(Li_{1/2} \cdot Nb_{1/2})_t$ and wherein $t + x + y + z = 1.00$, the composition ratios u, x, y, and z being given by a set of the following inequalities:
>
> $0.02 \leq u \leq 0.40$,
> $0.35 \leq x \leq 0.60$,
> $0.20 \leq y \leq 0.50$,

and

$$0.05 \leq z \leq 0.30.$$

In further accordance with this invention, at least one of calcium, strontium, and barium selected from the alkaline-earth metals may be substituted for up to 10 percent of lead contained in the above-mentioned solid solution. It is now possible to represent the composition by the formula:

$$(Pb_{1-u-v} \cdot Bi_u \cdot AEM_v) \cdot [M_f \cdot (Ni_{1/3} \cdot Nb_{2/3})_x \cdot Ti_y \cdot Zr_z] \cdot O_3, \quad (1)$$

wherein AEM represents at least one of calcium, strontium, and barium and wherein the mol ratio *v* is given by the following inequality:

$$0.00 \leq v \leq 0.10.$$

In the above-described solid solutions, lead, calcium, strontium, and barium act as divalent ions, bismuth and trivalent ions, and titanium and zirconium as tetravalent ions. In addition, the combinations ($Ni_{1/2}Ti_{1/2}$), ($Ni_{1/2}Zr_{1/2}$), and ($Li_{1/2}Nb_{1/2}$) are used in molecular ratios such that each combination will act as trivalent ions in effect. The combination ($Ni_{1/3}Nb_{2/3}$) is similarly used so as to act in effect as tetravalent ions.

In other words, Tsubouchi describes complex, multi-component ceramic compositions that had piezoelectric properties, and that were formed by high-temperature sintering. Calcium was an optional, minor constituent in some of the systems. Tsubouchi never suggested that calcium carbonate alone is piezoelectric.

Additionally, nothing in Tsubouchi suggested how any piezoelectric composition might be formed – regardless of its composition – simply by reaction from a solution. Recall that Nakagawa taught a process in which calcium carbonate was a reactant in solution. To the contrary, Tsubouchi's ceramics were formed by high-temperature sintering, e.g., at 1100°C to 1250°C (Col. 4, lines 20-21). The temperatures used in Tsubouchi's process are incompatible with the claimed invention. Hypothetically, if the polymer substrate of the present Claim 1 were subjected to such extreme heat, the polymer would immediately combust or otherwise decompose.

The Office is respectfully requested to withdraw the assertion that calcium carbonate is piezoelectric. Strictly in the alternative, the Office is respectfully requested

to provide evidence to support the following two propositions: **(1)** that calcium carbonate alone can behave as a piezoelectric material; and **(2)** that the piezoelectric properties will manifest in calcium carbonate that is deposited directly from solution, without high-temperature sintering.

It is respectfully submitted that calcium carbonate is not in fact piezoelectric, and that the § 102 rejection over Nakagawa was thus based on an incorrect premise. It is respectfully submitted that the § 102 rejection should accordingly be withdrawn.

Request for Telephonic Interview

For the reasons given above, it is respectfully submitted that all grounds of rejection have been overcome or should otherwise be withdrawn, and that the application should now be allowed.

In the alternative, if the Examiner should identify any remaining obstacles to allowance, then the Applicants respectfully request a telephonic interview to try to resolve any remaining issues, so that prosecution may be brought to an expeditious close.

If any issues that may remain are relatively minor or technical, then it might suffice for the Examiner and the undersigned (only) to participate in the interview. Such an interview could likely be scheduled on relatively short notice.

On the other hand, if there are substantive issues to be discussed, then the interview will likely be more fruitful if one or more of the inventors can also participate. In that case, if possible, about 14 calendar days' prior notice from the Examiner would be much appreciated. Advance notice will help to coordinate the respective schedules of the Examiner, the inventors, and the undersigned.

Conclusion

It is respectfully submitted that all grounds of rejection have been overcome, or should otherwise be withdrawn. Allowance of Claims 1-16 at an early date is respectfully requested.

Respectfully submitted,

/John H. Runnels/
John H. Runnels
Registration No. 33,451
Taylor, Porter, Brooks & Phillips, L.L.P.
P.O. Box 2471
Baton Rouge, Louisiana 70821
(225) 381-0257 (direct number)

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